THE MARIN COUNTYWIDE PLAN

NOISE ELEMENT

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I. INTRODUCTION

State law requires that a Noise Element be prepared as part of all city and county General Plans. Noise Elements are required to identify noise problems in the community and work toward their resolution. The Marin County Noise Element has been prepared to meet the requirements of State law.

The Marin County Board of Supervisors adopted a Noise Element as part of the Countywide Plan in 1975. The County has revised the Noise Element to incorporate new information and concerns related to community noise exposure levels. The purpose of the Element is to identify current and projected future noise levels from major sources, including Highway 101, the heliport adjacent to Richardson Bay, and the airport at Gnoss Field (north of Novato). Based on the levels of noise from these sources, the Element identifies programs to help mitigate significant noise problems in the community.

A. LEGAL AUTHORITY

The California Legislature has found that excessive community noise levels are a matter of statewide concern. In 1973 the Legislature adopted the Noise Control Act, which found:

> An excessive amount of noise is a serious hazard to the public health and welfare;
>
> Exposure to high levels of noise can result in physical and psychological damage; and
>
> There is a continuous and increasing amount of noise in urban, suburban, and rural areas. Upon making these findings, the State required that all general plans include noise elements to identify and help mitigate noise problems in the community.

Section 65302(f) of the California Government Code requires that a General Plan contain a noise element which:

> ...shall identify and appraise noise problems in the community. The noise element shall recognize the guidelines established by the Office of Noise Control in the State Department of Health and Human Services and shall analyze and quantify, to the extent practicable, as determined by the legislative body, current and projected noise levels for all of the following sources:
>
> - Highways and freeways;
>
> - Primary arterials and major local streets;

- Passenger and freight on-line railroad operations and ground rapid transit systems;

- Commercial, general aviation, heliport, helistop, and military airport operations, aircraft overflights, jet engine test stands, and all other ground facilities and maintenance functions related to airport operation;

- Local industrial plants, including, but not limited to, railroad classification yards;

- Other ground stationary noise sources identified by local agencies as contributing to the community noise environment.

- Noise contours shall be shown for all of these sources and stated in terms of community noise equivalent level (CNEL) or day-night average level (Ldn). The noise contours shall be prepared on the basis of noise monitoring or following generally accepted noise modeling techniques for the various sources identified in paragraphs (1) to (6), inclusive. The noise contours shall be used as a guide for establishing a pattern of land uses in the land use element that minimizes the exposure of community residents to excessive noise. The noise element shall include implementation measures and possible solutions that address existing and foreseeable noise problems, if any. The adopted noise element shall serve as a guideline for compliance with the state's noise insulation standards.

B. RELATIONSHIP TO OTHER GENERAL PLAN ELEMENTS

The Noise Element provides policy guidance for the siting and scale of development contained in the Community Development Element. The traffic-related data used for measuring noise levels associated with transportation are contained in the Transportation Element.

C. RELATIONSHIP TO OTHER GENERAL PLAN DOCUMENTS

The transportation-related data used for noise contour modeling along Highway 101 and major roads were obtained from Transportation Element Technical Report #3, Existing Conditions, and Report #4 Transportation Impacts of the Preferred Land Use Alternative.

D. ORGANIZATION OF THE ELEMENT

The introduction to the Element cites the legal authority for drafting a Noise Element and shows its relationship to other General Plan elements and documents. The second section reviews the previous Noise Element adopted in 1975. The third section discusses general impacts of noise on the community and defines terms and concepts related to the

quantification of noise. The third section discusses how noise is measured and the physical and psychological effects of noise. The fourth section lists existing Federal, State and County regulations which control sources of noise not addressed in the Element, such as amplified music. Following that section is a description of significant noise sources in the county. Where appropriate, a quantification of existing and projected levels of noise from each source is provided. Included in this section are the County guidelines for determining acceptable noise levels for transportation-generated noise and stationary noise sources. The seventh section identifies objectives, policies, and programs to help minimize exposure of persons to excessive amounts of noise.

II. POLICY HISTORY

The Noise Element of the Countywide Plan, which was adopted in 1975, was concerned exclusively with noise impacts of transportation facilities. It documented the physical and physiological effects of noise on the community, measured noise levels from major streets in the county, and established policies to achieve the following objectives:

> Alert the public regarding the potential impact of excessive transportation noises, as well as stationary source noises, and attempt to assign the cost of mitigating noise to those who produce the noise;
>
> Establish land use categories compatible with noise levels adjacent to transportation facilities, and endeavor to protect quiet areas from future noise impacts, and
>
> Minimize excessive noise levels of existing and future transportation facilities so that noise does not jeopardize public health and welfare.

In order to achieve these objectives, the 1975 Element recommended that an outdoor day-night sound level of 55 decibels for new residential uses be estimated and that usable outdoor areas not be exposed to noise levels over 60 decibels without mitigation.

The 1975 Element provided policies which were used in the review of projects along major roads. The implementation of these policies minimized the exposure of new development to excessive levels of noise produced by vehicular traffic. However, since the scope of the Element was limited exclusively to noise generated by vehicular traffic along major roads, the Element did not provide policy direction for noise impacts from other sources such as airports and railroads.

III. MEASUREMENT AND EFFECTS OF NOISE

A. SOURCES OF NOISE

A sound becomes "noise" when it is undesirable. Many factors can influence a person's judgment of whether or not a noise level is excessive. These factors include: noise

intensity, frequency (or pitch), duration, the time of day, and the activity with which the sound interferes. Other factors include a person's previous experience with noise, socioeconomic status, and educational status.

The description of noise currently in general use is the day-night average sound level (Ldn). The day-night average sound level is the average sound level over a 24-hour time period. Ldn is expressed in decibels (dB), which is the standard measure of sound pressure. Ldn includes the addition of a 10 dB penalty for sound levels which occur at night between the hours of 10:00 p.m. and 7:00 a.m. This nighttime penalty is based on the fact that most noise-sensitive activities occur between these hours.

Since the human ear can detect noise at some frequencies more easily than noise at other frequencies, filters are used with sound level measuring equipment to suppress frequency ranges that the ear cannot readily detect. The "A" filter is normally used in measurements of noise, since it was designed to match the frequency sensitivity of the human ear. Hence, noise levels are normally expressed as "A-weighted" levels. All sound or noise levels in this element are A weighted levels, abbreviated as dB or dBA. Also, all discussion of Ldn assumes that Ldn is measured in A-weighted decibels.

Figure N-1 shows average noise levels of common noise sources. An average whisper registers at 20 dBA. Freeways normally generate noise levels of 60 dBA or more. A loud automobile horn registers at about 100 dBA.

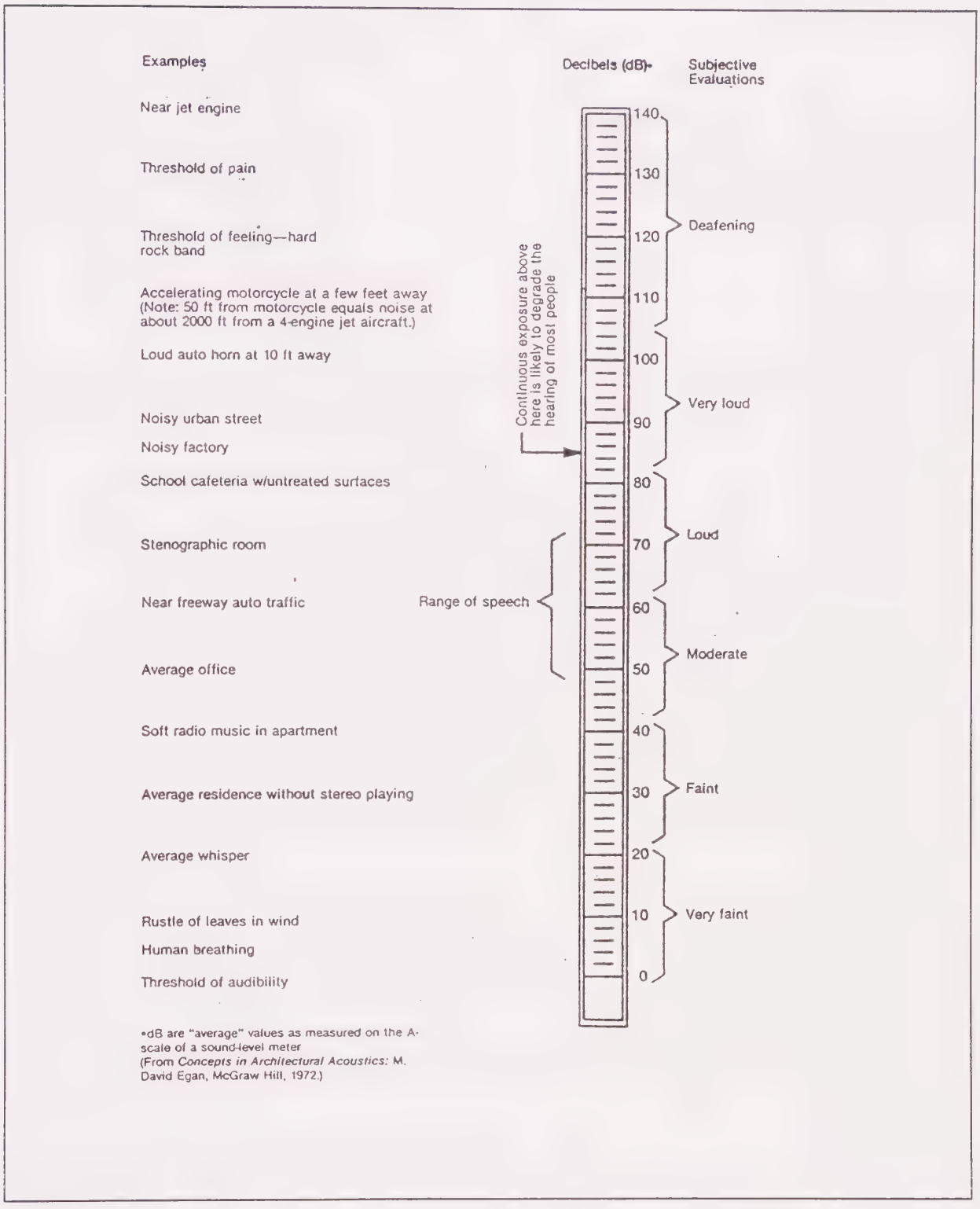
Because decibels are logarithmic units of measure, changes in decibels can be somewhat difficult to interpret. For example, a change of three decibels is hardly noticeable, while a change of five decibels is quite noticeable. An increase of ten decibels is dramatic and perceived as a doubling of the noise level. Figure N-2 further demonstrates the logarithmic nature of the decibel scale. An increase of ten decibels (from 50 dB to 60 dB) increases the percent of the population that is highly annoyed at the noise source by about 7%, while an increase of 20 dB (from 50 dB to 70 dB) increases the percentage by approximately 25%.

The decibel scale also has the following characteristics:

> For each doubling of distance from a point noise source (such as an air conditioning unit) the sound will decrease by about six decibels;
>
> For each doubling of distance from a line source (such as a freeway) noise levels are reduced by three to five decibels;

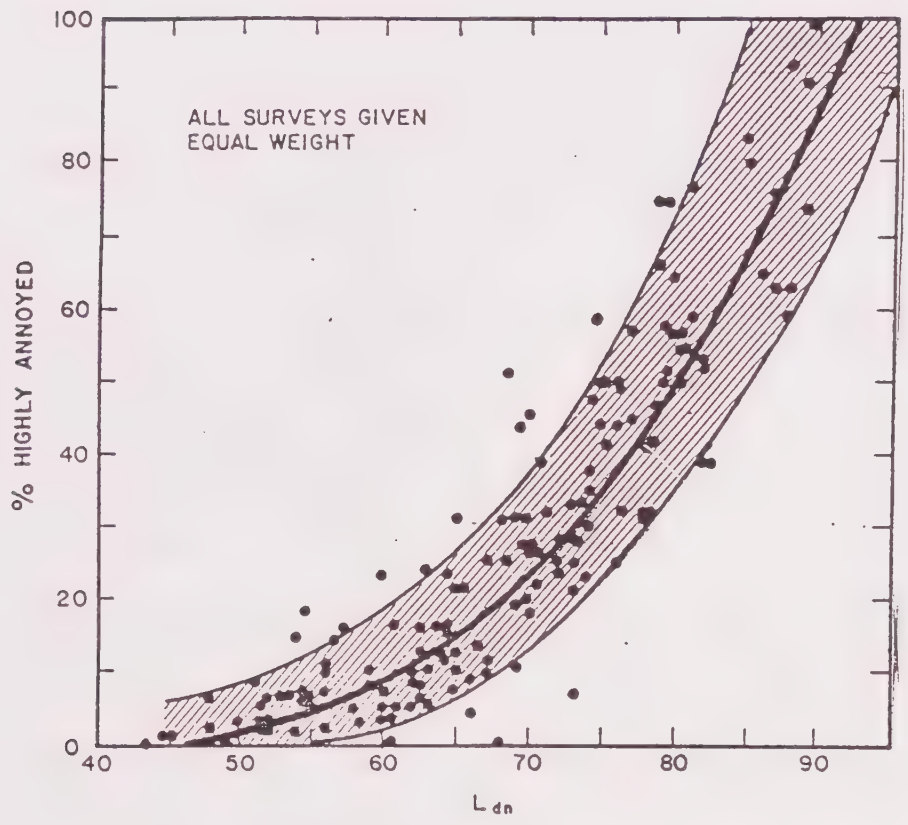
Two identical sounds from the same area increase the noise level by three decibels above the level of each separate noise source.

Figure N-1. Noise Levels of Common Noise Sources



Source: U.S. Department of Housing and Urban Development, 1985, The Noise Guidebook, p. 1

Figure N-2. Percentage of Persons Highly Annoyed from Exposure to Noise at Various Levels



Source: California Department of Transportation: Division of Aeronautics, 1983, Airport Land Use Planning Handbook, p. 34

In Marin County, the day-night average sound level is most affected by transportation-related noise sources: the freeway, busy roads, the airport and the heliport. These noise sources tend to affect a greater number of people over a broad geographic area. Other noise sources affect immediate neighbors, but not a large number of people. "Episodic" noise sources such as construction activity or a barking dog will produce temporary increases in noise levels in the immediate vicinity, but will not have much affect on the day-night average sound level.

The day-night average sound level is the appropriate measurement for regulating land uses which either produce or are sensitive to transportation-related noise. Other types of noise generators may be regulated by measuring the "peak" noise level they are likely to produce. Standards may be adopted to prevent stationary source noise generators from

emitting noise above a certain decibel level for a prescribed length of time. Quantitative noise ordinances often have this type of noise regulation.

B. PHYSICAL EFFECTS OF NOISE

Loss of hearing can result from either a single exposure to high intensity noise such as a blast or explosion or from longer exposures to lower, but still damaging, noise levels. Studies have shown that exposure to damaging levels of noise may increase the risk of high blood pressure and heart disease. Noise has also been related to headaches, fatigue, insomnia, ulcers, and colitis.

C. PSYCHOLOGICAL EFFECTS OF NOISE

Excessive levels of noise can cause anxiety, irritability, emotional stress, nausea, vertigo, lack of coordination, and mental confusion. Noise can also prevent people from sleeping so that they become lethargic or nervous.

IV. EXISTING NOISE REGULATIONS

A. FEDERAL REGULATIONS

1. Occupational Safety and Health Administration

The Federal Occupational Safety and Health Administration (OSHA) has established standards which protect workers from exposure to excessive levels of noise. OSHA requires that firms provide conservation programs for workers exposed to noise levels of more than 85 dBA and prohibits exposure of workers to noise levels exceeding 120 dBA.

2. Federal Highway Administration

The Federal Highway Administration and the California Department of Transportation have similar policies for new roadway construction and roadway expansion. These policies contain noise abatement criteria for lands adjacent to highways and selected roads. These criteria are used for determining when noise abatement measures should be evaluated.

B. STATE REGULATIONS

1. Vehicle Code

Vehicle noise limits are contained in the State Vehicle Code. Proper muffling can bring the exhaust system of most motorcycles, cars, and trucks into compliance with State noise limits. The State Vehicle Code also limits noise levels from sound amplification systems in automobiles. The California Highway Patrol and County Sheriffs are responsible for enforcement of the Vehicle Code.

2. Uniform Building Code and Administrative Code

The State Uniform Building Code and Title 24, Part 2 of the State Administrative Code require certain sound insulation measures to be incorporated into the design and construction of all new residential construction other than detached single-family dwellings. The County Building Inspection Department is responsible for enforcing these requirements.

C. COUNTY REGULATIONS

1. Loud and Unnecessary Noise Ordinance

Chapter 6.70 of Marin County Code (Loud and Unnecessary Noises) restricts the creation and continuation of loud, unnecessary, or unusual noise. This ordinance, enforced by the County Sheriff's Department, prohibits excessive noise levels from various sources including motor vehicles, amplification systems, and persons yelling.

2. Wind Energy Conversion Systems

Chapter 22.71 of Marin County Code, "Wind Energy Conversion Systems (WECS)," specifies the maximum noise level of WECS at the property line in residential areas (55 dBA) and all other areas (60 dBA). This ordinance is enforced by the County Community Development Agency.

3. Conditions of Permit Approval

Community Development Agency staff is responsible for evaluating noise impacts when reviewing permits for new and existing development. Conditions of permit approval may include conditions to reduce noise impacts on neighboring parcels, such as limiting the hours of construction. Community Development Agency staff is responsible for enforcing conditions of permit approval.

4. The Marin County Airport (Gnoss Field) Land Use Plan

The County has prepared an Airport Land Use Plan (ALUP) for the Marin County public airport at Gnoss Field in compliance with State Aeronautics Law (California Public Utilities Code, Chapter 4, Article 3.5). Noise measurements of the airport were made for the plan, and policies were established for future land use in the vicinity of the airport. The Noise Element is required to be consistent with the policies of the ALUP.

The airport must also meet noise regulations in Title 21 of the Administrative Code. The Airport Land Use Plan describes Title 21 in the following manner:

Title 21 of the California Administrative Code provides noise regulations that govern the operation of aircraft and aircraft engines for all airports operating under a valid permit issued by the Division of Aeronautics.

The regulations are designed to cause an airport proprietor, aircraft operator, local governments, pilots and the Division of Aeronautics to work cooperatively to diminish the problem of aircraft noise. The regulations are designed to accomplish this end by controlling and reducing the impacts of aircraft noise on nearby communities.

The Community Noise Equivalent Level is the noise measurement required by the Division of Aeronautics for establishing an airport's noise impact boundary. A CNEL value of 65 decibels is the noise impact criterion for noise-sensitive land uses, such as single- and multi-family dwellings, trailer parks and schools. Such uses are considered compatible with airport/aircraft noise exposures of 65 dB CNEL or less.

V. NOISE ISSUES IN UNINCORPORATED AREAS

The following discussion quantifies the existing and projected levels of noise from major noise sources in unincorporated areas of the county. Traffic noise along roads is the primary source of noise in Marin County. Other major sources of noise include: (1) aircraft in the vicinity of the Marin County Airport at Gnoss Field; (2) helicopter traffic in the vicinity of the heliport located adjacent to Richardson Bay; and (3) railroad traffic along the Northwestern Pacific right-of-way. Other noise from stationary sources, such as construction sites, kennels, industrial equipment and farm machinery may affect the immediate neighbors.

Although significant levels of noise from sources such as amplifiers, automotive sound systems, and persons yelling may occur, they are covered by State and County regulations regarding nuisances. Consequently, noise from those sources is not included in the following discussion.

A. NOISE FROM VEHICULAR TRAFFIC

The noise generated from vehicular traffic is the primary source of noise in Marin County. The level of noise from traffic is influenced by a number of factors, the most significant of which are:

- the number of trucks, buses, motorcycles and cars;
- the speed of travel along the road;
- the distance between the roadway and the receiver;
- the slope or gradient of the roadway; and,
- the presence or absence of barriers between the roadway and the receiver.

1. Existing Noise Levels

Existing noise levels from major roads in unincorporated areas were measured in two ways. First, noise was measured at six roadside locations in 1987, with continuous 24-hour measurements at three highway locations, and longer term measurements at three other roadside locations along coastal access routes. Second, the existing noise levels from major roads were estimated based on calculations of traffic volumes in 1987. The model used to generate traffic volume figures is the same model used to estimate traffic volumes for the Transportation Element of the Countywide Plan.

a. Measurements of Existing Noise Levels

Technical Report #4 of the Noise Element, Marin County Noise Measurements, presents measurements of noise levels at six locations throughout the county. The study was performed by consultants in August and September, 1987. Figure N-3 shows the approximate location of each of these sites. Table N-1 summarizes the findings of Technical Report #4.

The measurements indicate that average noise levels from recreational-based traffic along coastal access routes were about the same as noise levels of commuter traffic along the same routes. For example, the Ldn of the site at Sir Francis Drake Boulevard in Woodacre was 71 dBA on both Friday and Saturday. The hours of highest noise levels differed between Friday and Saturday for all three coastal access routes. Generally, high noise levels from traffic on Friday was concentrated during typical commute hours of 6 a.m. and 9 a.m., while noise levels on Saturday were fairly consistent throughout the day.

b. Estimates of Existing Noise Levels on County Roads

Noise levels from a selected sample of major roads in unincorporated Marin County were estimated for the year 1987. The estimates were used as a "baseline" with which to compare estimates of future noise levels. Estimated average daily traffic volumes were derived from the County's transportation model as well as from actual counts. Traffic volumes for the major roads were converted to estimates of noise levels using the methods approved by the Federal Highway Administration (FHWA RD-77-108) and Caltrans Vehicle Noise Emission Levels.

A noise contour model was used to provide both baseline and future estimates. The model uses formulas which assume that noise travels over a "featureless plain" of flat ground with no obstructions. The model *does not* take into account topographical characteristics of the land along the road segments, such as hills; atmospheric conditions; or the existence of buildings, landscaping, and natural vegetation.

Table N-1. Marin County Noise Measurements

Site	Location	Feet From Center of Roadway	Date	Noise Level (Ldn)	Max. dBA	Number of Times 80 dBA Exceeded
1	Black Point (Highway 37)	106	8/5- 8/6/87	71	99	83
2	St. Vincent's - Silveira Ranch (Highway 101)	800	8/5-8/6/87	56	76	0
3	Woodacre (Sir Francis Drake Blvd.)	45	8/6-8/7/87	71	92	121
			8/8/87	71	97	68
			8/9/87	-	91	45
4	Cheese Factory (Petaluma/Point Reyes Road)	37	8/6-8/7/87	68	103	88
			8/8/87	67	87	59
			8/9/87	-	91	80
5	Pt. Reyes Station (Highway 1)	43	8/13-8/14/87	62	85	18
			8/15/87	64	91	37
			8/16/87	-	100	38
6	Marin City (Highway 101)	100*	9/3-9/4/90	75	93	26

Source: Illingworth and Rodkin, 1987, Marin County Noise Measurements, 22 p.
* Measurements were taken 100 feet from the southbound lane of Highway 101.

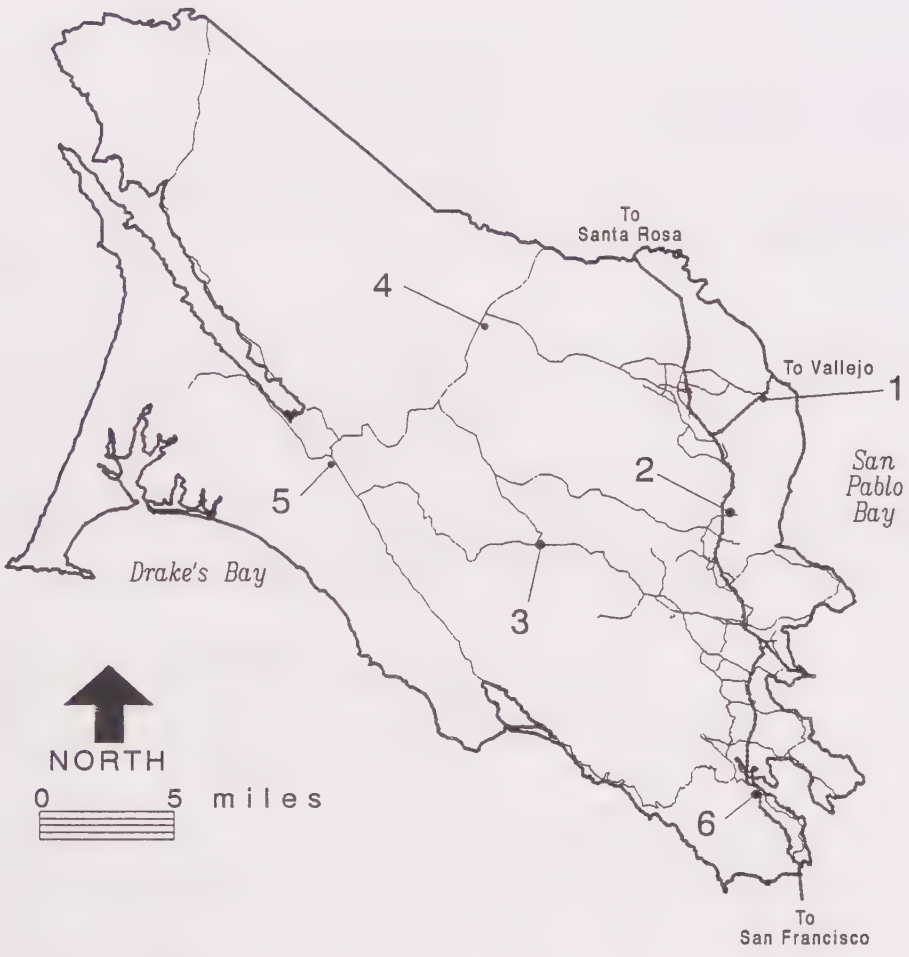
The Ldn for the sites ranged from 56 dB (800 feet from the centerline of Highway 101 at St. Vincent's/Silveira Ranch) to 75 dB (100 feet away from the southbound lane of Highway 101 at the Marin City Redevelopment site). The highest noise level measured was 103 dBA (37 feet from the centerline of the Petaluma/Point Reyes Road near the Marin-Sonoma Cheese Factory). This event occurred Friday afternoon between the hours of 12 p.m. and 1 p.m. and was likely caused by an emergency siren.

Although most measurements were made relatively close to the road, the St. Vincent's measurement was made at an 800 foot setback. The City of San Rafael had a policy that no residential development would be permitted closer than 400 feet from the roadway at this site. Having made many measurements along Highway 101, the consultants wanted to make a conservative estimate of where noise levels would be low enough for residential development. They estimated that 800 feet might be that distance. Measurements confirmed that the noise level at 800 feet was below the 60 dBA threshold appropriate for residential uses.

The purpose of noise contour modeling is to provide a conservative estimate of where an acoustical analysis should be performed for new development. The model measures only noise from vehicles along a street without nearby stationary noise sources. Noise "contours" are the distance in feet from the street centerline to a position where the observer would experience noise of a given loudness. The noise contours used were 60, 65, 70, 75 and 80 decibels. The baseline estimates appear in Appendix N-1.

Figure N-3

Location of Noise Measurements



Source: Illingworth & Rodkin, 1987,
Marin County Noise Measurements, pp. 16-22

2. Projections of Noise Levels

Highways and streets are expected to continue to be the major noise sources in the county. Projections of future noise levels along selected county roads are listed in Appendix N-1. Along most roadways, noise levels are calculated to increase by as much as 2 dBA. The largest projected increases are 3 dBA along Bel Marin Keys Boulevard and Nicasio Valley Road and 4 dBA along Novato Boulevard.

3. Noise Attenuation Along Highway 101

In recent years the State Department of Transportation (Caltrans) has been widening sections of Highway 101 according to County transportation policy. An auxiliary lane was built in San Rafael and High Occupancy Vehicle lanes have been built from Puerto Suello Hill in San Rafael to Highway 37 in Novato. As part of the environmental review of any highway widening projects, Caltrans is required to make a noise assessment with respect to State and Federal noise guidelines. If the project is estimated to raise noise levels by 12 dBA, or if there are residences which would be subject to noise levels approaching or exceeding 67 dBA during the "noisiest" hour, Federal and State law require Caltrans to evaluate the feasibility mitigating the noise impacts in the most cost effective manner.

Caltrans has found that if there are many residences in the affected area, often the most cost effective way to meet the noise standards is to build "sound walls." They have built walls along two sections of Highway 101: in San Rafael between Downtown and Puerto Suello Hill and in Novato between Ignacio and Highway 37. In reaction to the walls built in Novato, residents and planning officials have expressed concern that building walls along remaining portions of the freeway would create a "tunnel" through Central and Northern Marin. Treasured, scenic views of the landscape and bay would be blocked. In addition, noise reflected off soundwalls may appear in unexpected places due to the influence of atmospheric and topographic conditions.

Because of the potential for sound walls along Highway 101 to create a view-blocking "tunnel" through Central and Northern Marin, planning officials have recommended that the County of Marin adopt a policy that opposes sound walls along Highway 101 as a means of noise mitigation. Such a policy would alert Caltrans that the County recommends that Caltrans consider other means of noise mitigation. Alternate noise mitigation measures available to the County and Caltrans include berms, landscaping, setbacks from major roads (for noise sensitive uses) and siting of noise insensitive uses closer to noise sources to serve as a physical barrier between roads and noise sensitive uses. An example of the latter option may be obtained in mixed use developments. Relatively noise insensitive uses such as offices or industrial buildings would be located closer to the road while noise sensitive uses such as homes and schools would be located farther from the road. The siting of multifamily housing may make use of the buildings to shield outdoor areas such as courtyards from noise sources. The buildings themselves may be insulated to minimize interior noise levels.

B. AIRCRAFT NOISE

Noise from aircraft is often more intrusive and has a higher potential noise impact than noise from traffic along roadways. The visibility of aircraft at low altitudes and typically lower ambient noise levels around airports seem to create a heightened awareness of general aviation activity. Noise levels are also influenced by the number of aircraft, the type of aircraft engine, the distance between the flight path/runway and the receiver, and the presence or absence of physical barriers between the flight path/runway and the receiver.

1. Existing Noise Levels at the Marin County Airport at Gnoss Field

The Marin County Airport at Gnoss Field is located immediately east of Highway 101, north of Novato. A master plan was prepared for the site in July, 1989, to provide the County with guidelines to be used in making decisions on the development of facilities at Gnoss Field through the year 2006. Noise contours showing noise levels in the vicinity of the airport as of 1986 were included in a Draft Environmental Impact Report prepared for the Master Plan[1]. These contours are shown in Figure N-4.

2. Projected Noise Levels at the Marin County Airport at Gnoss Field

The master plan for the airport at Gnoss Field indicates that the number of aircraft based at Gnoss Field is expected to increase by 127 aircraft, increasing from 283 aircraft in 1986 to 410 in the year 2006 (Cortright & Seibold, 1989, Airport Master Plan: Marin County Airport (Gnoss Field), p. 3.13). The additional 127 aircraft are expected to generate a greater number of takeoffs and landings, projected at an increase of 60,000 takeoffs and landings between 1986 and the year 2000. The airport is likely to generate a higher average day-night level of noise, but noise levels at peak periods may remain the same.

A new runway perpendicular to the existing runway is expected to be developed by the year 1997. Aircraft taking off or landing on the newer runway would generate Ldn noise levels of more than 60 dBA in areas currently unaffected by aircraft noise. Noise contours showing projected noise levels are shown in Figure N-5.

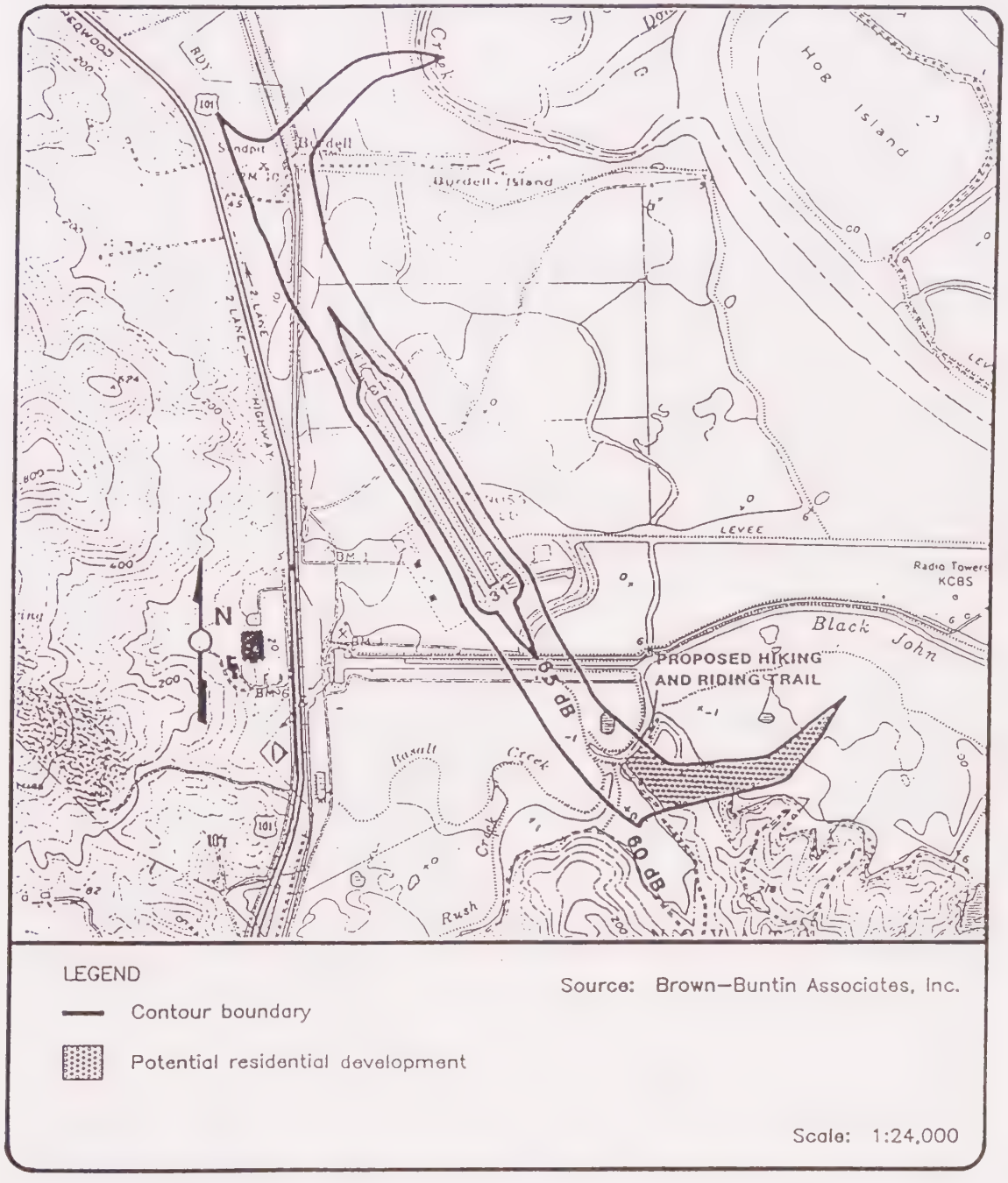
C. NOISE FROM THE HELIPORT

As discussed in the preceding section, there are a number of factors which influence noise levels from aircraft, including the type of aircraft engine, and the presence of physical barriers.

1. Existing Noise Levels at the Heliport Site

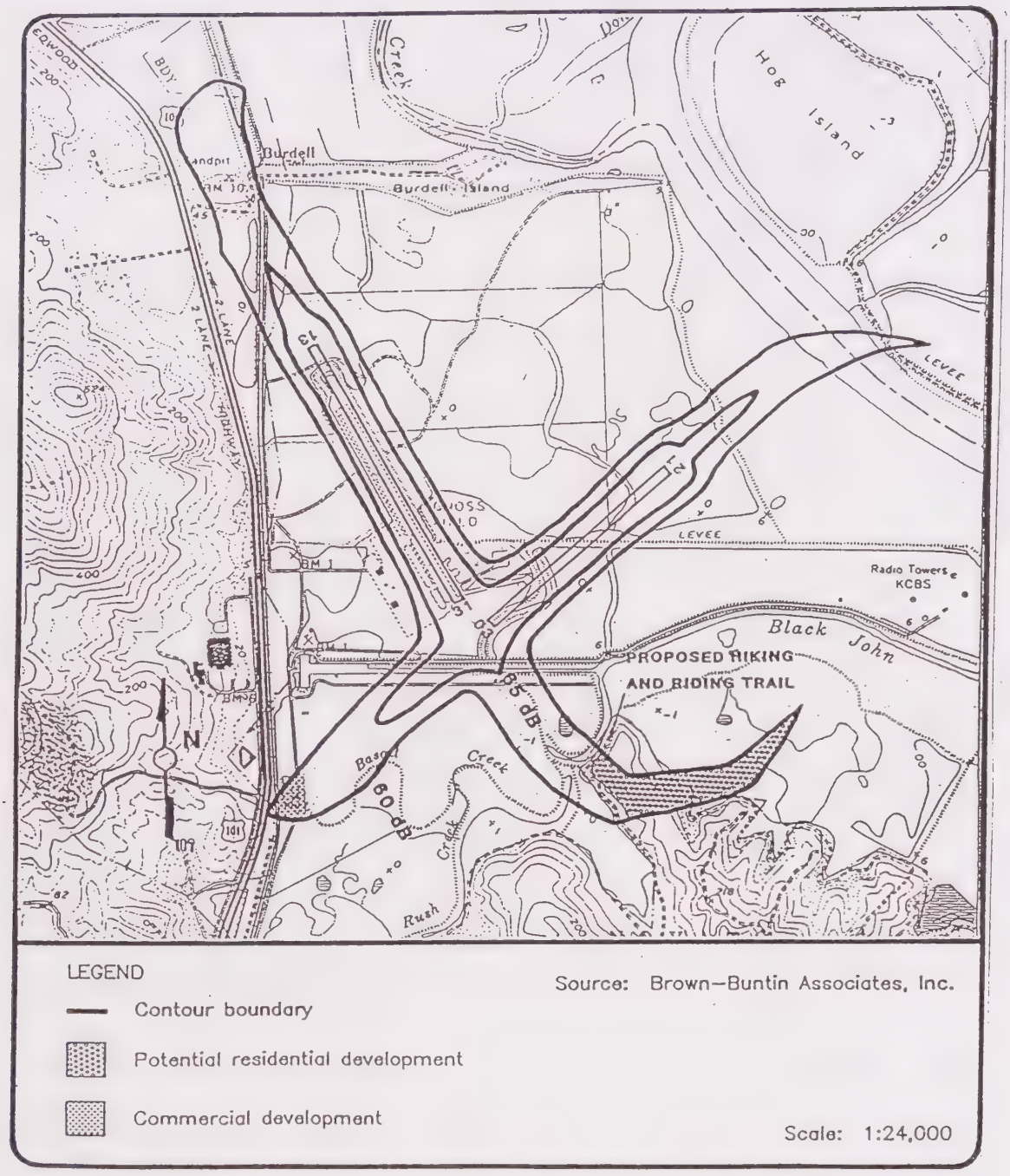
Noise levels at the commercial heliport on Richardson Bay are shown in Technical Report #3 of the Noise Element. The Technical Report indicates approximately 25 helicopter takeoffs and landings per week at the Richardson Bay Heliport[2].

Figure N-4. Existing Noise Contours for the Airport at Gnoss Field, 1986



Source: Cortright & Seibold, 1988, Draft Environmental Impact Report/Environmental Assessment: Marin County (Gnoss Field) Airport, p. 6.41.

Figure N-5. Projected Future Noise Contours for the Airport at Gnoss Field 2006



Source: Cortright & Seibold, 1988, Draft Environmental Impact Report/Environmental Assessment: Marin County (Gnoss Field) Airport, p. 6.42.

Measurements were made at four sites between September 23, 1987, and September 25, 1987. The data collection sites were the four residential developments nearest the heliport: the houseboats located off the end of Pohono Street, the Marin Headlands development, the houseboats in the vicinity of Gate 6 Marina, and the single-family homes on Strawberry Point. Figure N-6 gives noise contours of the heliport site based on the noise measurements. The contours show locations subject to Ldn noise exposure levels of 55 dBA and 60 dBA.

2. Future Noise Levels at the Heliport Site

The operators of the heliport do not expect a significant increase in the number of takeoffs or landings from the heliport site[3]. Therefore, the noise contours shown in Figure N-6 are not likely to change significantly in the future.

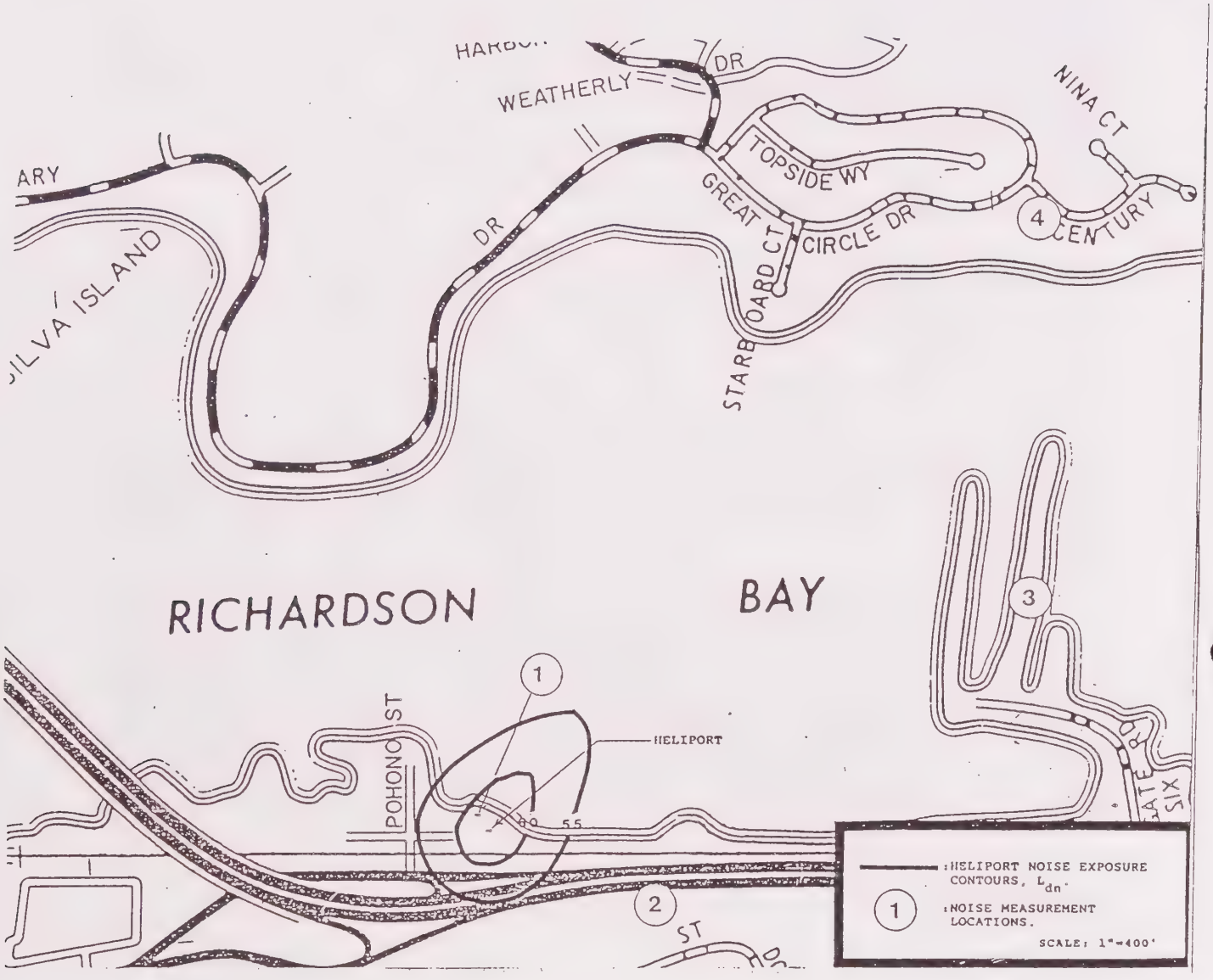
D. NOISE FROM THE RAILROAD

The most significant noise problem associated with trains are from the engine and horn. Noise generated by the wheels of railroad cars passing over joints between sections of railroad ties[4] and warning signals at grade crossings also contribute to noise levels along railroad lines.

1. Existing Noise Levels Along the Northwestern Pacific Railroad Tracks

There are only two trains passing through Novato each day. Whereas the joints between the tracks were formerly bolted together, they are now welded together. The welded joints provide a smoother transition between sections of track, reducing the amount of noise generated by the wheels of trains as they pass over the joints[5]. However, the noise from the trains may still be intrusive in residential sleeping areas.

Figure N-6. Existing Noise Contours for the Heliport



Source: Illingworth & Rodkin, 1987, Preparation of General Plan Noise Exposure Contours for the Commercial Heliport Located on Richardson Bay in Marin County, p. 8.

2. Future Noise Levels Along the Northwestern Pacific Railroad Right-of-way

In the future, the Northwest Pacific Railroad transitway may be an additional source of noise within the County. The three types of vehicles that could be used along transitway are diesel buses, electric light rail trains, and diesel-powered trains. The vehicle types have significantly different noise generation characteristics.

Diesel-powered trains make the loudest noise. Moving at an average speed of 45 to 50 miles per hour, diesel-powered trains generate noise levels of 88-93 dBA at a distance of 50 feet, while diesel buses and light rail trains typically generate noise levels of 76 to 85 dBA at 50 feet. Given the proximity of some residential uses, potentially significant "peak" noise problems may arise with any of these types of vehicles along the transitway.

As of December, 1992, there was an insufficient amount of information to identify noise contours for future transit operations along the Northwest Pacific railroad right-of-way. Noise contours could be identified only after the type of vehicle to be run along the railway is selected. The Noise Element should be amended at that time to include noise contours for the project.

E. NOISE LEVELS FROM CONSTRUCTION

Construction of new buildings can also generate excessive noise levels. Figure N-7 shows noise levels of equipment used in construction. Air compressors can be as loud as 85 dBA, saws can be over 90 dBA, and trucks can create noise levels of 95 dBA. Noise problems from construction activity are especially acute in quiet areas, and during quiet periods of the day (between the hours of 7:00 p.m. and 7:00 a.m.). Other factors which influence the degree of noise exposure include the topography of the site and its surroundings, the distance between the construction sites and the receiver, and the access route to the construction site.

1. Existing Levels of Noise from Construction

Noise from construction activities is the most prevalent source of noise-related complaints filed with the County Sheriff's Department[6]. Community Development Agency staff also reviews and refers a number of complaints related to construction noise each year.

2. Future Noise Levels from Construction Activity

Programs contained in this Element are designed to minimize the number of complaints due to excessive construction noise levels. For example, implementation of Program N-2.4a restricts the hours of construction to times of the day during which noise would not normally disturb the neighborhood as much.

F. NOISE FROM OTHER STATIONARY SOURCES

Other stationary sources of noise besides construction activity include industrial air conditioning units, large-scale refrigerators, trash compactors, loading docks and electric generators.

Noise levels from these sources fluctuate widely depending on a variety of factors, including the type of noise source, the distance between the noise source and the receiver, and the presence of physical barriers. Due to noise level fluctuation, it is inappropriate to identify noise contours for these stationary sources. Programs in the Noise Element are designed to minimize potential noise impacts from stationary sources such as those mentioned above.

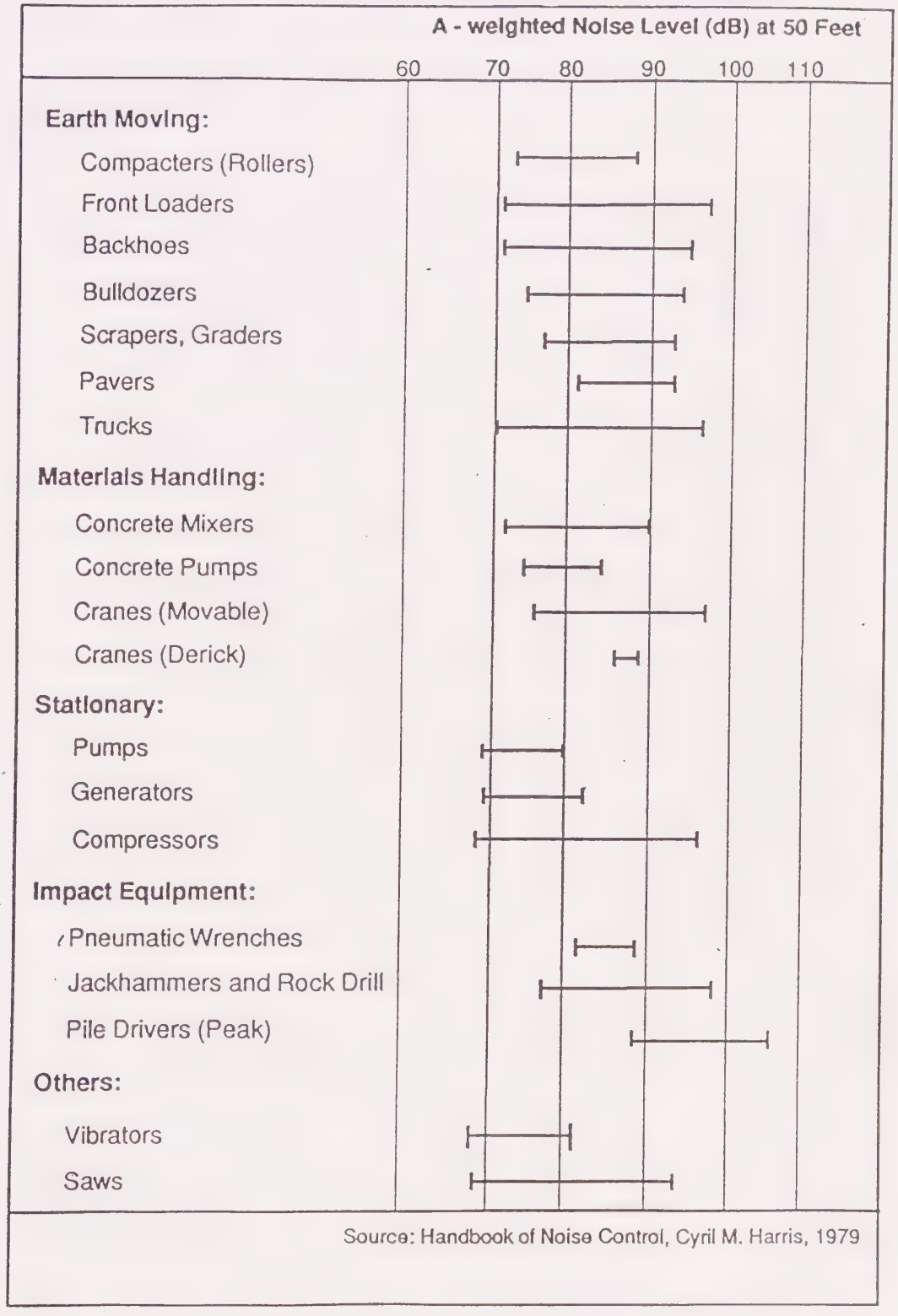
VI. NOISE STANDARDS FOR DEVELOPMENT

In determining the appropriate noise standards for Marin County, the County has referred to a document entitled Guidelines for the Preparation and Content of the Noise Element of The General Plan. This document includes a table of land uses compatible with different "Community Noise Environments." Based on the State recommendations, Table N-2 provides guidance for appropriate land uses at various levels of noise exposure. The guidelines are primarily used for transportation-related noise sources. The County has adopted policies and programs to maintain appropriate noise levels and protect noise-sensitive land uses such as residences and schools from excessive noise levels.

Residential, public and institutional land uses should not be subjected to noise levels above 60 dBA Ldn. Noise levels below 60 dBA Ldn are desirable. In commercial areas, the acceptable noise level is 65 dBA. In industrial and agricultural areas, the acceptable noise level is 70 dBA. Residential land uses within agricultural areas, including, for example, a family's home on a dairy ranch, are considered residental uses for noise level classification purposes. The 60 dBA Ldn (or lower) standard applies to residential uses within agricultural areas. The County requires an acoustical analysis for all new development projects which require master plans, design review, or use permits when located in areas that exceed these thresholds.

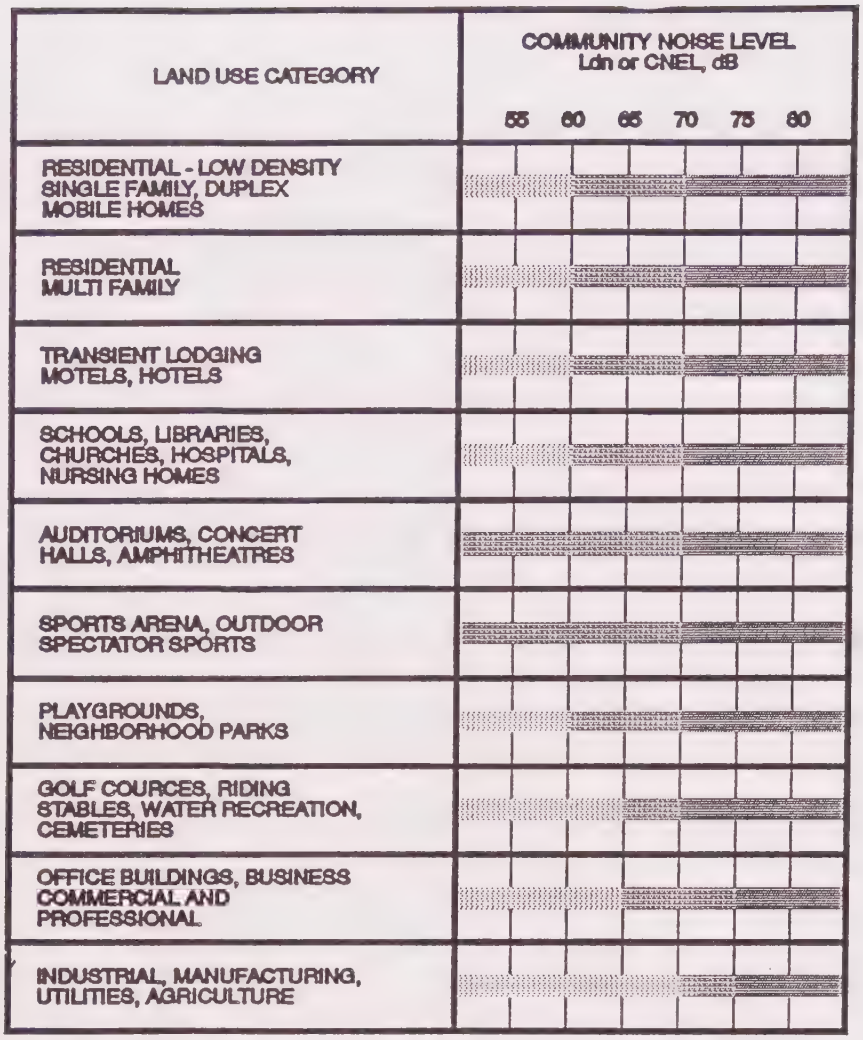
The County has a policy of encouraging mixed use development (a combination of commercial and residential uses) as a means of increasing the supply of housing, especially affordable housing. If housing is allowed in commercial, industrial or agricultural areas there is the potential for residents to experience noise levels higher than would be the case in strictly residential areas. The siting and design of housing should take into account both transportation-related and stationary source generated noise levels in non-residential areas. The permit approval process for master plans, design review and use permits shall take noise mitigation into account in order to minimize the noise impacts on residential land uses.

Figure N-7. Construction Equipment Noise Level Ranges



Source: Handbook of Noise Control (Cyril M. Harris, 1979)

Table N-2. Land Use Compatibility for Community Noise Environments



INTERPRETATION

NORMALLY ACCEPTABLE

Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional contruction, without any special noise insulation requirements.

CONDITIONALLY ACCEPTABLE

New construction should be under taken only after a detailed analysis of the noise reduction requirments is made and needed noise insulation features included in the design. Conventional construction, but with closed windows and fresh air supply will normally suffice.

NORMALLY UNACCEPTABLE

New construction of development should generally be discouraged. IF new construction or development does procedd, a detailed analysis of the noise reduction requirements must be made and needed noise insulation features included in the design.

The County has also adopted separate standards for stationary noise sources such as mechanical equipment, quarries, kennels, or industrial facilities. When use permits for these types of facilities are renewed, the historical/traditional use of the property and the character of the area should be considered in the application of noise standards. The noise standards establish benchmarks for allowable noise levels in residential areas and for other noise-sensitive land uses. These standards would be applicable to new residential development proposed near existing stationary noise sources. In these cases, new residential development may need to incorporate sound reduction construction methods into the project design. These standards will also apply to new stationary noise sources proposed near existing residential areas or noise-sensitive land uses. Measures to reduce noise impacts from the proposed stationary source may be required. Table N-3 shows the standards for stationary noise sources.

It should be noted that the standards in Table N-3 are for purposes of planning and siting land uses. The table is not a noise ordinance and is not to be used to achieve the same objectives as a noise ordinance would. The standards in Table N-3 are not to be used for regulating existing noise sources or enforcement concerning noise problems.

Table N-3. Benchmarks for Allowable Noise Exposure From Stationary Noise Sources

	Daytime (7 a.m. to 10 p.m.)	Nighttime (10 p.m. to 7 a.m.)
Hourly L_{eq}, dB	50	45
Maximum Level, dB	70	65
Maximum Level, dB (Impulsive Noise)	65	60

Guidelines for Use of Table N-3:

1. The measurements are made at the property line of the receiving land use. The effectiveness of noise mitigation measures should be determined by applying the standards on the receptor side of noise barriers or other property line noise mitigation measures.

2. The nighttime standards apply only when the receiving land use operates or is occupied during nighttime hours.

3. Sound level measurements to determine maximum level noise shall be made with "slow" meter response.

4. Sound level measurements for impulsive noise sources shall be made with "fast" meter response. Impulsive noises are defined as those which have sharp, loud

peaks in decibel levels but which quickly disappear. Examples include a dog's bark, a hammer's bang and noise with speech or music content.

5. The allowable noise level standard shall be raised to the ambient noise level in areas where the ambient level already exceeds the standards shown in this table. For example, if the neighborhood already experiences daytime hourly noise levels of 60 dBA as an ambient condition, the noise level standard shall be raised to 60 dBA.

6. The allowable noise level shall be reduced 5 dB if the ambient hourly L_{eq} is at least 10 dB lower than the noise level standard shown in this table. For example if the neighborhood experiences daytime hourly noise levels of 40 dBA as an ambient condition, the noise level standard shall be lowered to 45 dBA.

VII. OBJECTIVES, POLICIES, AND IMPLEMENTATION PROGRAMS

Objective N-1. Protection From Excessive Noise Levels. **To site and design new development projects in a manner that minimizes the exposure of residents and workers to excessive levels of noise.**

Policy N-1.1 **Use Noise Level Guidelines-New Development.** The County shall use noise level guidelines contained in this element to direct the siting, design, and insulation of new commercial and residential development.

Program N-1.1a Use the CEQA Process and Discretionary Review to Minimize Exposure to Excessive Noise Levels. Both CEQA and discretionary review of new development shall ensure that new development is protected from excessive noise levels. Potential noise impacts and mitigation measures shall be evaluated through discretionary review procedures such as environmental review, master plans, design review and use permits.

Program N-1.1b Noise Guidelines for New Projects Exposed to Transportation-Generated Noise. Table N-2, "Land Use Compatibility for Community Noise Environments" and the noise contours shown in Appendix N-1 shall be used as a guide for determining the appropriate type of new development and its relation to ambient noise levels.

An acoustical analysis shall be performed for new residential development in areas with greater than 60 dBA outdoor Ldn to determine the appropriate mitigation measures for meeting an exterior noise level of 60 dBA, measured at the property line, and an interior noise level of 45 dBA. The threshold for performing an acoustical analysis shall be 65 dBA existing outdoor Ldn for office and retail commercial development and 70 dBA existing outdoor Ldn for industrial commercial development. The acoustic analysis shall determine ambient noise level conditions and mitigation measures necessary to minimize the exposure of residents and/or workers to excessive levels of noise.

Program N-1.1c Noise Guidelines for New Projects Exposed to Stationary Source Noise Generators. Table N-3 shall be used as a guide for establishing allowable noise levels produced by stationary noise generators.

An acoustical analysis shall be performed for new residential projects and other noise-sensitive uses proposed near stationary source noise generators in order to determine the appropriate mitigation measures for conforming to the standards in Table N-3. Effective mitigation measures shall be incorporated into the new development to reduce exposure to noise levels at or below the standards shown in Table N-3.

Program N-1.1d — Noise Guidelines in the Gnoss Field Environs. The County Community Development Agency will review new development proposals within two miles (referral area) of Gnoss Field for consistency with the noise criteria set forth in the adopted Airport Land Use Plan.

Objective N-2. Prevent Significant Noise Impacts From New Development in Existing Developed Areas. To ensure that new development does not significantly increase noise levels within existing residential, commercial, industrial and agricultural areas, and to ensure that noise from new development does not exceed County guidelines.

Policy N-2.1 — **Use Noise Level Guidelines-Existing Development.** The County shall use noise level guidelines contained in this element to protect existing land uses from noise generated by new development.

Program N-2.1a — Use the CEQA Process and Discretionary Review to Protect Existing Land Uses From Significant Noise Impacts Due to New Development. Both CEQA and discretionary review of new development shall determine the noise impacts of new development. Potential noise impacts and mitigation measures shall be evaluated through environmental review, master plans, design review, use permits and other discretionary permits in cases of significant increases in noise levels.

Program N-2.1b — Noise Guidelines to Protect Existing Land Uses from Transportation-Generated Noise Due to New Development. Table N-2 shall be used as a guide to establish allowable noise levels. Where the existing noise level is rated "Normally Acceptable", if new development raises the Ldn by more than 5 dBA but the noise level still remains in the "Normally Acceptable" category, it is considered a significant impact. In areas where the existing noise level is "Normally Acceptable", if new development raises the Ldn by more than 3 dBA and the noise level exceeds the "Normally Acceptable" standard, it is considered a significant impact. In areas that already exceed the "Normally Acceptable" noise level, if new development raises the

Ldn by more than 3 dBA, it is considered a significant impact. When a significant impact occurs, mitigation measures shall be required.

Program N-2.1c — Noise Guidelines to Protect Existing Land Uses from Stationary Source Noise Generated by New Development. Table N-3 shall be used as a guide to establish allowable noise levels. New noise-generating development proposed near existing residential or other noise-sensitive land uses shall have an acoustical analysis performed to determined the appropriate mitigation necessary to conform to the standards in Table N-3. Effective mitigation measures shall be incorporated into the new development to reduce exposure to noise levels at or below the standards shown in Table N-3.

Table N-2 shall be used to determine allowable noise levels for commercial, industrial, agricultural or other less noise-sensitive land uses exposed to stationary source noise generated by new development.

Policy N-2.2 — **Minimize Noise Impacts From Possible Future Transitway.** If a transitway is developed along the Northwestern Pacific right-of-way, the noise impacts of transit vehicles on existing development should be minimized.

Program N-2.2a — Quantify Noise Levels From Possible Future Transitway. When sufficient information exists to quantify noise levels generated by vehicles traveling along the Northwestern Pacific right-of-way, the noise contours should be incorporated into this Element.

Program N-2.2b — Develop Mitigation Measures to Minimize Impacts of Possible Future Transitway. Based on information generated through implementation of Program N-2.2a, mitigation measures shall be developed to ensure that existing developed areas are not subject to excessive noise levels from the proposed transitway.

Policy N-2.3 — **Oppose Sound Walls Along Highway 101**. The County of Marin opposes sound walls as a means of noise mitigation along Highway 101.

Program N-2.3a — Coordination with Caltrans. The County will work with the California Department of Transportation (Caltrans) to ensure that adequate studies are prepared and alternative noise mitigation measures are considered. The County will also request that

Caltrans consult with local officials and with residents outside the noise impact boundary defined by Caltrans.

Policy N-2.4 **Minimize Impacts From Excessive Noise Levels Due to Construction Activity.** During all phases of construction, measures should be taken to minimize the exposure of neighboring properties to excessive noise levels from construction-related activity.

Program N-2.4a Limit Construction Hours. The Community Development Agency reserves the right to set hours for construction-related activities involving the use of machinery, power tools or hammering. The type of construction, site location and noise-sensitivity of nearby land uses will determine the hours of construction. The conditions of approval will specify hours for staging and type of construction activities. Special consideration shall be given to homeowners who perform their own work.

Policy N-2.5 **Minimize Noise Impacts from Temporary Land Uses.** The permit review process for land uses of a temporary nature, such as fairs or exhibits, should include mitigation measures to minimize their noise impacts on surrounding areas. The Ldn from the temporary use should be in conformance with the noise level guidelines for nearby land uses.

Policy N-2.6 **Coordinate With Other Public Agencies**. The County shall work with other public agencies to address both existing and potential noise impacts resulting from public agency activities. The County shall cooperate with other public agencies in determining the appropriate mitigation measures necessary to meet County noise guidelines.

NOTES

1 The California Department of Transportation Aeronautics division uses the "Community Noise Equivalent Level" (CNEL) system of noise measurement, instead of the "Day Night Average Sound Level" (Ldn) system used by federal agencies. There is very little difference between the two measuring systems; calculations of CNEL and Ldn from the same data generally result in a difference of less than 0.7 dB. Thus, for the purposes of this report, CNEL values and Ldn values are interchangeable.

2 Illingworth and Rodkin, Inc., 1987, Preparation of General Plan Noise Exposure Contours for the Commercial Heliport Located on Richardson Bay in Marin County, p. 8.

3 Telephone conversation with Commodore Helicopter operations representative, February 25, 1991.

4 Phone conversation with Robert McLosky, Operator for the Southern Pacific Transportation Company, September 6, 1990.

5 Ibid.

6 Interview with Lieutenant Donovan of the Marin County Sheriff's Department, August 30, 1990.

APPENDIX N-1. EXISTING AND PROJECTED FUTURE TRAFFIC NOISE LEVELS

EXISTING AND PROJECTED FUTURE TRAFFIC NOISE LEVELS

Table A-1 shows noise contours in tabular form for Highway 101 and selected arterials in the unincorporated area. Using average daily vehicle volumes for 1987 and buildout, the table shows the distance in feet from the street centerline to a specific noise decibel contour (e.g. 60, 65, 70, etc). The decibels are "A-weighted" day-night average sound levels (dBA Ldn).

Existing conditions are represented by traffic counts from 1987, the base year for transportation and noise modeling for the Countywide Plan. Projected future noise levels are measured for "buildout." Buildout is defined as the complete development of all developable parcels according to local General Plans and local development policies. Traffic estimates produced by the transportation model used for the Transportation Element of the Countywide Plan were used for noise contour modeling.

It is important to note that the noise contour and decibel levels shown in Table A-1 are estimates derived from a noise contour model. They are not actual measurements at the site. The model which calculated the noise contours uses formulas which assume that noise would travel over a "featureless plain," which is flat ground with no obstructions. The model *does not* take into account topographical characteristics of the land along the road segments (such as hills), atmospheric conditions, or the existence of any buildings or landscaping (including natural vegetation).

The purpose of noise contour modeling is to provide a conservative estimate of where an acoustical analysis should be performed for new development. The model results measure only noise from vehicles along a street without nearby stationary noise sources. For example, if the 60 dBA contour is estimated to be 200 feet from the street centerline and residential development is proposed within 200 feet of the street centerline, an accoustical analysis should be performed at the site to determine actual noise conditions. Noise impacts of traffic from cumulative development in the area would be calculated based on existing conditions and projected traffic counts.

A measurement for one road segment is shown below. It is used as an example of how to interpret the noise contour table.

		SPEED			TRUCK%		CONTOUR DISTANCE (FEET) Ldn					
	ADT	AU	MT	HT	MT	HT	50'	80	75	70	65	60
1 Nicasio Valley Road												
From: Sir Francis Drake Blvd.												
Present	2,578	45	45	45	3.1	0.9	63	0	0	0	31	98
Future	3,393						64	0	0	0	41	118
To: Lucas Valley Road												

The table measures noise contours along Nicasio Valley Road between Sir Francis Drake Blvd. and Lucas Valley Road. Average daily traffic volumes are shown under the column labeled "ADT" for both "Present" (Existing conditions, 1987) and "Future" (projections at buildout). For this segment, the ADT is 2,578 and 3,393 vehicles per day, respectively.

Under the column labeled SPEED, posted speed limits for automobiles (AU), medium weight trucks (MT) and heavy trucks (HT) are listed (posted speed limit is 45 for all vehicles). Vehicle speed greatly influences noise levels. Under the column labeled TRUCK%, the percentage of average daily traffic represented by medium-weight (MT) and heavy-weight (HT) trucks are listed. Medium-weight trucks comprise 3.1% of existing traffic, heavy trucks, 0.9%. Trucks produce more noise than automobiles. Truck traffic on Nicasio Valley Road is low.

The next column, "Ldn 50' " contains an estimate of the noise level at 50 feet from the street centerline, an approximation of the edge of the street right-of-way. For this segment of Nicasio Valley Road, the estimated noise level in 1987 was 63 dBA. The projected noise level is 64 dBA.

The last set of columns, under the heading CONTOUR DISTANCE, shows how many feet from the street centerline a particular noise contour lies (or how far one has to be away from the street centerline to experience noise of a given loudness). The five levels of loudness are 60, 65, 70, 75 and 80 dBA. The noise level is 65 dBA at 31 feet from the street centerline. At 98 feet from the street centerline, the noise level drops to 60 dBA. Due to the projected increase in traffic and increase in noise, the 65 dBA contour is farther from the street centerline at buildout, 41 feet. Likewise, the 60 dBA contour moves to 118 feet from the centerline.

TABLE A1

Existing (1987) and Projected Future (2005)
TRAFFIC NOISE LEVELS

	ADT	SPEED AU	SPEED MT	SPEED HT	TRUCK% MT	TRUCK% HT	Ldn 50'	CONTOUR DISTANCE (FEET) 80	75	70	65	60
1 ALAMEDA DEL PRADO SOUTH												
FROM: IGNACIO BLVD.												
PRESENT	6,941	25	25	25	3.1	0.9	61	0	0	0	0	71
FUTURE	4,420						60	0	0	0	0	45
TO: HIGHWAY 101 RAMP												
2 ATHERTON AVE.												
FROM: OLIVE AVE.												
PRESENT	3,453	40	40	40	3.1	0.9	63	0	0	0	31	99
FUTURE	6,623						66	0	0	0	60	153
TO: BUGEIA AVE.												
3 BEL MARIN KEYS BLVD WEST												
FROM: MONTEGO KEY												
PRESENT	4,815	35	35	35	3.1	0.9	63	0	0	0	32	101
FUTURE	9,791						66	0	0	0	65	162
TO: HAMILTON DRIVE												
4 BON AIR ROAD												
FROM: SOUTH ELISEO DR.												
PRESENT	10,201	25	25	25	3.1	0.9	63	0	0	0	33	102
FUTURE	9,393						63	0	0	0	30	96
TO: SIR FRANCIS DRAKE BLVD.												
5 BUTTERFIELD ROAD												
FROM: DEER HOLLOW ROAD												
PRESENT	7,511	30	30	30	3.1	0.9	63	0	0	0	35	108
FUTURE	7,025						63	0	0	0	33	103
TO: LEGEND ROAD												
6 COLLEGE AVE.												
FROM: SIR FRANCIS DRAKE BLVD.												
PRESENT	12,891	25	25	25	3.1	0.9	64	0	0	0	41	120
FUTURE	11,712						64	0	0	0	38	112
TO: KENT AVE.												
7 HIGHWAY 1												
FROM: ALMONTE BLVD.												
PRESENT	26,476	35	35	35	3.1	0.9	70	0	0	56	146	314
FUTURE	27,000						71	0	0	57	148	318
TO: HIGHWAY 101												
FROM: MARSHALL-PETALUMA RD												
PRESENT	2,450	55	55	55	3.1	0.9	65	0	0	0	48	133
FUTURE	2,678						65	0	0	0	53	141
TO: POINT REYES-PETALUMA ROAD												

	ADT	SPEED			TRUCK%		Ldn	CONTOUR DISTANCE (FEET)				
		AU	MT	HT	MT	HT	50'	80	75	70	65	60
7 HIGHWAY 1												
FROM: OLEMA BOLINAS ROAD												
PRESENT	3,641	55	55	55	3.1	0.9	67	0	0	0	72	173
FUTURE	4,228						67	0	0	26	83	191
TO: PANORAMIC HIGHWAY												
FROM: PANORAMIC HIGHWAY												
PRESENT	9,019	35	35	35	3.1	0.9	66	0	0	0	60	153
FUTURE	9,970						66	0	0	0	66	164
TO: LORING AVE.												
FROM: SIR FRANCIS DRAKE BLVD (WEST)												
PRESENT	2,807	55	55	55	3.1	0.9	65	0	0	0	55	145
FUTURE	3,174						66	0	0	0	62	157
TO: SIR FRANCIS DRAKE BLVD (EAST)												
FROM: WHITACKER BLUFF												
PRESENT	1,850	55	55	55	3.1	0.9	64	0	0	0	36	110
FUTURE	2,003						64	0	0	0	39	116
TO: DILLON BEACH												
8 HIGHWAY 101												
FROM: GOLDEN GATE BRIDGE												
PRESENT	112,321	55	55	55	3.1	0.9	81	70	170	366	788	1697
FUTURE	97,409						81	61	154	333	716	1544
TO: SAUSILITO LATERAL												
FROM: BRIDGEWAY BLVD												
PRESENT	142,000	55	55	55	3.1	0.9	82	88	198	428	921	1985
FUTURE	128,398						82	80	186	400	861	1856
TO: SHORELINE HIGHWAY												
FROM: SONOMA COUNTY LINE												
PRESENT	64,000	55	55	55	3.1	0.9	79	40	117	251	541	1167
FUTURE	62,492						79	39	115	247	533	1148
TO: ATHERTON AVE.												
FROM: SHORELINE HIGHWAY												
PRESENT	128,000	55	55	55	3.1	0.9	82	80	185	399	860	1852
FUTURE	115,922						82	72	173	373	805	1733
TO: REDWOOD HIGHWAY FRONTAGE RD.												

		SPEED	TRUCK%		CONTOUR DISTANCE (FEET)				
	ADT	AU MT HT	MT HT	Ldn 50'	80	75	70	65	60
9 HIGHWAY 101 NORTH									
FROM: MILLER CREEK/ST VINCENT'S									
PRESENT	126,000	55 55 55	3.1 0.9	82	78	183	395	851	1832
FUTURE	119,943			82	75	177	382	823	1773
TO: ALAMEDA DEL PRADO									
10 HIGHWAY 37									
FROM: ATHERTON AVE.									
PRESENT	20,100	55 55 55	3.1 0.9	74	0	40	116	250	539
FUTURE	31,851			76	0	63	158	340	733
TO: HARBOR DRIVE									
11 HIGHWAY 580									
FROM: SAN QUENTIN									
PRESENT	45,000	55 55 55	3.1 0.9	77	28	89	199	428	922
FUTURE	49,724			78	31	98	212	458	986
TO: BELLAN BLVD.									
12 LUCAS VALLEY ROAD									
FROM: LAS GALLINAS AVE.									
PRESENT	11,924	45 45 45	3.1 0.9	70	0	0	45	127	273
FUTURE	11,900			70	0	0	45	127	273
TO: HIGHWAY 101									
13 MARSHALL - PETALUMA ROAD									
FROM: SHORELINE ROAD									
PRESENT	315	45 45 45	3.1 0.9	54	0	0	0	0	0
FUTURE	393			55	0	0	0	0	0
TO: HICKS VALLEY ROAD									
14 NICASIO VALLEY ROAD									
FROM: PT. REYES-PETALUMA RD.									
PRESENT	3,540	45 45 45	3.1 0.9	64	0	0	0	42	122
FUTURE	6,167			67	0	0	0	74	176
TO: LUCAS VALLEY ROAD									
FROM: SIR FRANCIS DRAKE BLVD									
PRESENT	2,578	45 45 45	3.1 0.9	63	0	0	0	31	98
FUTURE	3,393			64	0	0	0	41	118
TO: LUCAS VALLEY ROAD									
15 NORTH SAN PEDRO ROAD									
FROM: CIVIC CENTER DRIVE									
PRESENT	14,234	25 25 25	1.4 0.4	63	0	0	0	33	104
FUTURE	17,848			64	0	0	0	42	121
TO: WOODOAKS DR.									

	ADT	SPEED AU	SPEED MT	SPEED HT	TRUCK% MT	TRUCK% HT	Ldn 50'	CONTOUR DISTANCE (FEET) 80	75	70	65	60
16 NOVATO BLVD.												
FROM: PT. REYES-PETALUMA RD.												
PRESENT	2,059	45	45	45	3.1	0.9	62	0	0	0	0	78
FUTURE	4,781						66	0	0	0	57	149
TO: SAN MARIN DRIVE												
17 PANORAMIC HIGHWAY												
FROM: SEQUOIA VALLEY ROAD												
PRESENT	3,901	35	35	35	3.1	0.9	62	0	0	0	26	82
FUTURE	4,009						62	0	0	0	27	84
TO: HIGHWAY 1												
18 PT. REYES-PETALUMA RD.												
FROM: HICKS VALLEY ROAD												
PRESENT	3,971	45	45	45	3.1	0.9	65	0	0	0	48	131
FUTURE	5,195						66	0	0	0	62	157
TO: NOVATO BLVD.												
FROM: HIGHWAY 1												
PRESENT	3,768	45	45	45	3.1	0.9	65	0	0	0	45	127
FUTURE	6,714						67	0	0	25	80	186
TO: NICASIO VALLEY ROAD												
19 SEMINARY DRIVE												
FROM: RICARDO WAY												
PRESENT	4,025	35	35	35	3.1	0.9	62	0	0	0	27	84
FUTURE	5,225						63	0	0	0	35	106
TO: TOPSIDE WAY												
20 SIR FRANCIS DRAKE BLVD.												
FROM: PLATFORM BRIDGE ROAD												
PRESENT	2,198	55	55	55	3.1	0.9	64	0	0	0	43	123
FUTURE	2,462						65	0	0	0	48	133
TO: HIGHWAY 1												
FROM: EL PORTAL DR.												
PRESENT	49,933	40	40	40	3.1	0.9	75	0	45	127	273	588
FUTURE	46,876						74	0	42	122	262	564
TO: HIGHWAY 101												
FROM: OAK MANOR DRIVE												
PRESENT	11,135	35	35	35	3.1	0.9	67	0	0	0	74	176
FUTURE	13,822						68	0	0	29	92	203
TO: NICASIO VALLEY ROAD												

		SPEED			TRUCK%			CONTOUR DISTANCE (FEET)				
	ADT	AU	MT	HT	MT	HT	Ldn 50'	80	75	70	65	60
20 SIR FRANCIS DRAKE BLVD.												
FROM: SAN QUENTIN												
PRESENT	19,742	45	45	45	3.1	0.9	72	0	0	75	177	382
FUTURE	21,919						72	0	26	83	190	410
TO: LARKSPUR LANDING CIRCLE												
21 TIBURON BLVD EAST												
FROM: REDWOOD FRONTAGE ROAD												
PRESENT	16,063	45	45	45	3.1	0.9	71	0	0	61	155	333
FUTURE	15,065						71	0	0	57	148	319
TO: STRAWBERRY DRIVE												
22 WOLFE GRADE												
FROM: SIR FRANCIS DRAKE BLVD												
PRESENT	13,417	35	35	35	3.1	0.9	67	0	0	28	89	199
FUTURE	13,625						68	0	0	29	90	201
TO: SAN RAFAEL AVE.												
23 ALMONTE BLVD.												
FROM: SHORELINE HIGHWAY												
PRESENT	20,379	35	35	35	3.1	0.9	69	0	0	43	122	263
FUTURE	20,180						69	0	0	42	121	262
TO: MILLER AVE.												
24 LAS GALLINAS AVE.												
FROM: LUCAS VALLEY RD.												
PRESENT	5,367	25	25	25	3.1	0.9	60	0	0	0	0	55
FUTURE	4,607						60	0	0	0	0	47
TO: MILLER CREEK												
25 LUCAS VALLEY ROAD												
FROM: LAS GALLINAS												
PRESENT	10,493	45	45	45	3.1	0.9	69	0	0	40	116	251
FUTURE	11,419						69	0	0	43	123	265
TO: IDYLBERRY ROAD												
26 MILLER CREEK RD.												
FROM: MARINWOOD AVE.												
PRESENT	7,420	25	25	25	3.1	0.9	62	0	0	0	0	75
FUTURE	10,793						63	0	0	0	35	106
TO: LAS GALLINAS AVE.												
27 N. SAN PEDRO RD.												
FROM: CIVIC CENTER DRIVE												
PRESENT	8,252	25	25	25	1.4	0.4	61	0	0	0	0	61
FUTURE	10,797						62	0	0	0	25	80
TO: MEADOW DRIVE												

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NOISE ELEMENT